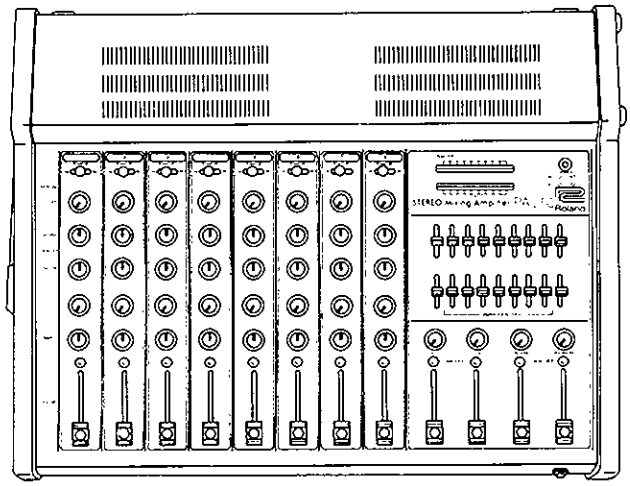
PA-250

Operation Manual

Roland



Introduction

The Roland PA-250 Powered Mixer is an 8-input/2-output audio control center with self-contained spring reverberation unit and 9-band Graphic Equalizers for each Output Channel. The 2-channel Power Amplifier section delivers a clean 125 watts rms per channel into 4Ω (85 watts per channel into 8Ω), and the eight primary Input Channels accept signals from microphones, musical instrument pick-ups, electronic keyboard outputs, signal processing devices or tape recorder outputs. In addition, the first two Input Channels can be used for disc playback. Each of these two inputs has a switch-selectable fixed RIAA disc playback equalization circuit. All Input Channels have easy-to-handle sliding fader Volume Controls for riding gain. An LED Overload Indicator on each Input Channel gives visual warning of potentially distortion-producing conditions. Rotary Attenuator Controls (pads) for each Input Channel have an adjustment range of 40 dB, more than adequate to eliminate overload in any Input Channel.

Eight dual-section Equalizers are provided to enable the user to tailor the tonal characteristics of each input signal. These Equalizers have continuously variable rotary boost and cut controls in both the high frequency (treble) and low frequency (bass) sections with detents at the flat (no boost or cut) settings on both controls for easy, repeatable return to original "untouched" signal conditions.

Special effects can be added to the output signals of the unit by means of either or both of the PA-250's effects systems. Each Input Channel has a combination On/Off—Effect Selector switch (Stand By Switch) that when activated can send a portion of the corresponding input signal to either the Echo Effect Buss (which requires an external echo device) or to the Reverb Effect Buss (which utilizes the PA-250's built-in spring reverberation unit). The amount of any input signal that is sent to either Effect Buss is determined by individual Effect Controls on each Input Channel.

The two Output Channels of the PA-250 can be used as a stereo pair, and left-to-right positioning of input signals can be achieved by means of the Panpot Controls for each Input Channel.

In addition to the eight primary inputs (and Phono Inputs), the PA-250 features a dual-channel line level Auxiliary Input, with a dual section volume control. Direct input access to the Left and Right Mixing Busses is also provided (MIXING BUSS IN L & R jacks) so that the line level outputs of another mixer (Roland PA-150, PA-80, KM Series) can be combined in the PA-250 output signals. Line level outputs from the PA-250 (MASTER OUT and MONITOR OUT jacks) are available for connection to the MIXING BUSS IN jacks of another mixer, external power amplification (Roland SPA-120, SPA-240), or other audio equipment.

For 2-channel recording during live performances, the PA-250 REC OUT jacks supply line level signals that are derived directly from the Mixing busses, and are not processed through the Graphic Equalizers.

Stereo Headphone monitoring is available at a Front Panel HEADPHONE jack, with a volume control that is independent of the Master Volume Controls.

Although the PA-250 was designed primarily for sound reinforcement/stage monitor applications, this versatile unit will perform a variety of audio control functions. For examples of different uses for the PA-250, consult the Applications section.

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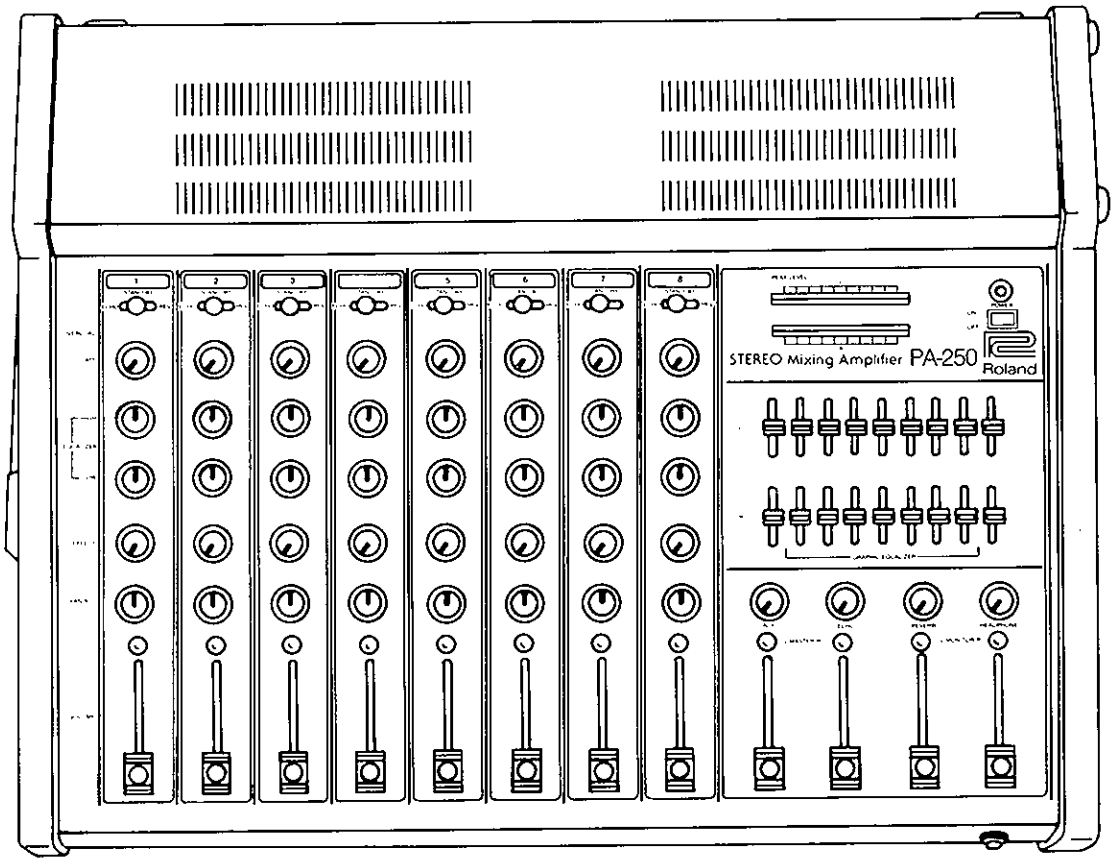
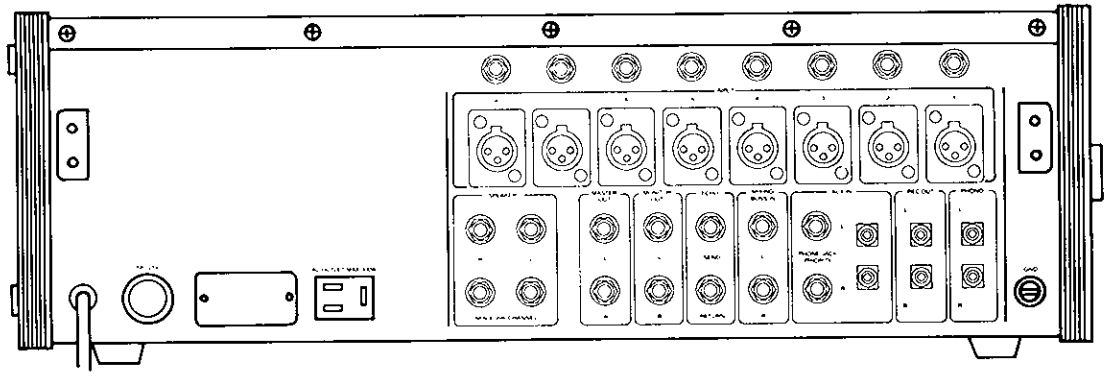
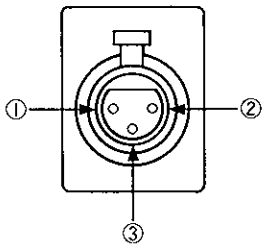
Front and Back Panel Layout





Back Panel of the PA-250C.

★PIN CONNECTION (XLR TYPE CONNECTOR)★



[①②: GND
③ : HOT]

Unbalanced

Control Descriptions

Stand By Switch

This three-position lever switch performs combined Input Channel On/Off and Effect Selector functions. In the STAND BY position (centered) the Switch prevents signal present in the associated Input Channel from reaching the Mixing and Effect Busses. Therefore, the Stand By Switch on a particular Input Channel must be in either the ECHO or REV (Reverb) position if the signal from that Input Channel is to be mixed into the output signals of the PA-250. This is true even if no effects are desired.

Overload Indicator

Although the Overload Indicators are not actually controls, a description of their function is included in this listing because these visual monitoring aids are intended for use in conjunction with the Attenuator Controls on each Input Channel (see *Attenuator Control*, below). The Overload Indicator is a red LED which is connected to circuitry that senses the output level of the corresponding Input Pre-amplifier (see Block Diagram). When this output level reaches the point at which overload distortion begins to occur in the Input Pre-amplifier, the Overload Indicator will light. The Overload Indicators on all Input Channels function independently of the Stand By Switches and Input Channel Volume Controls.

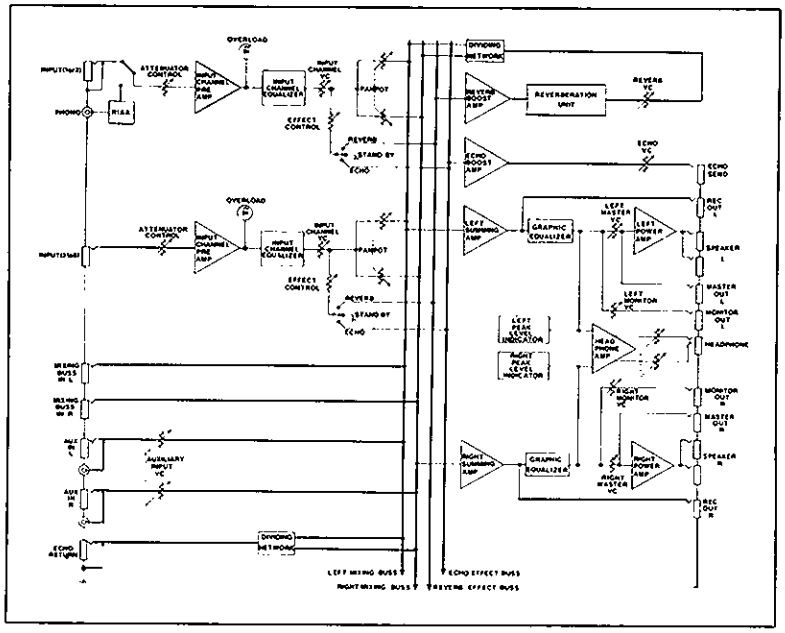


Figure 1

Attenuator Control (labeled ATT; Orange Pointer)

The Attenuator Control is a continuously variable rotary control that acts on the input signal before the signal reaches the Input Pre-amplifier. This Control is provided for the purpose of "trimming" input signal levels so that they are correct for the Input Pre-amplifier. The 40 dB range of the Attenuator Control, from fully counter-clockwise for maximum attenuation (reduction) of input signal level, to fully clockwise for no attenuation, enables each Input Channel to accept signals ranging in level from microphone level (−50 dBm) and phono level (−45 dBm) to line level (−10 dBm). The combined use of the Attenuator Control and Overload Indicator provides a means of preventing overload distortion in the Input Pre-amplifier.

The Attenuator controls on Input Channels 1 and 2 have detents at the extreme counter-clockwise position. When these Attenuator Controls are in the detented position (marked PHONO on the Control Panel), the normal input signal paths from the Rear Panel phone jacks INPUT 1 and INPUT 2 are disconnected, and the Input Pre-amplifiers for Input Channels 1 and 2 receive signals from the PHONO L and R RCA jacks on the Rear Panel. The signals from the PHONO L and R jacks are routed through fixed equalization circuits which provide the RIAA Standard de-emphasis frequency response curve necessary for proper disc playback.

Equalizer (Yellow Pointers)

The Equalizer on each Input Channel is divided into two sections, each of which has a continuously variable rotary control. The position of the control for the section marked HIGH determines the amount of boost or cut applied to the input signal in the treble portion of the audio spectrum. Similarly, the control for the section marked LOW performs the same function in the bass portion of the spectrum. There is a detent on each Equalizer rotary control at the flat (no boost or cut) position. This position (yellow pointers at "12 o'clock") is marked with a zero (0) on the numbered scales surrounding each rotary

control. Positions of a rotary control clockwise from the detent (towards the plus sign (+) on the scale) will cause the Equalizer circuitry to boost the portion of the spectrum (bass or treble) associated with that control, the amount of boost being proportional to the amount of rotation. Positions of a rotary control counter-clockwise from the detent (towards the minus sign (−) on the scale) will cause the Equalizer circuitry to cut the corresponding portion of the spectrum. Again, the amount of cut is determined by the amount of rotation.

Effect Control (Green Pointer)

The position of this continuously variable rotary control determines the amount of signal sent from an Input Channel to the Effect Buss selected for that Input Channel with the Stand By Switch. When the Effect Control is turned fully counter-clockwise (the position marked with a zero (0) on the Control Panel), *no signal* will be sent to the selected Effect Buss. As the control is turned clockwise from this extreme, signal will reach the selected Effect Buss, the amount being determined by the amount of clockwise rotation. The Effect Control receives its signal from a point in the Input Channel signal path *after* both the Input Channel Volume Control and Equalizer (see Block Diagram).

Panpot (Blue Pointer)

The Panpot Control performs the function of routing the input signal from an Input Channel to the Left and/or Right Mixing Busses. By means of the Panpot Control, input signals can be sent exclusively to one Mixing Buss or the other, to both Mixing Busses equally, or, since the Panpot Control is continuously variable, to both Mixing Busses in any relative proportion desired. When the two Output Channels of the PA-250 are used to feed speakers that are set up in a stereo array, movement of a Panpot control from left to right will have aural effect of moving the associated input signal from left to right in the stereo field. Thus, in sound reinforcement applications, the Panpot Control may be used to correlate the aural position of an input signal in the stereo field with the stage position of the performer or instrument producing the signal.

Volume Control

The position of this sliding fader control determines the level of signal reaching the Panpot Control, and thus the Mixing Busses, from an Input Channel. When this control is at the extreme lower end of its travel (marked with a zero (0) on the Control Panel), none of the corresponding input signal will reach the Mixing Busses. Also, no Effect signal can be sent from an Input Channel in this condition, regardless of the positions of the Stand By Switch and Effect Control. However, the Overload Indicator and Attenuator Control will still perform their normal functions.

Graphic Equalizers

Each Output Channel of the PA-250 has associated with it a 9 band Graphic Equalizer. The center frequencies of the nine bands are spaced one octave apart across the audio spectrum. Each sliding control is labeled with the center frequency of the octave that it affects: 63 Hz, 125 Hz, 250 Hz, 500 Hz, 1 kHz, 2 kHz, 4 kHz, 8 kHz, 16 kHz. The Graphic Equalizers are provided for the purpose of contouring the frequency responses of the Output Channels to eliminate feedback and/or to achieve acoustical compatibility with different performance locations. Each of the sliding controls has an adjustment range of ± 12 dB, and a detent at the flat (no boost or cut) position. This position is labeled 0 dB on the Control Panel. For exact boost, cut and frequency ranges of the Graphic Equalizer controls, consult the plotted responses in the Appendix labeled Graphic Equalizer Frequency Response Curves.

Auxiliary Input Volume Control (Labeled AUX; Orange Pointer)

This continuously variable rotary control is actually two controls on the same shaft. This control regulates the amount of signal reaching the Left and Right Mixing Busses from an external piece of equipment (having up to two channels delivering nominal levels of −20 dBm) connected to the Rear Panel jacks labeled AUX IN L and R. This control operates in normal volume control fashion; the fully counter-clockwise position permits no signal through the control, and positions clockwise from this extreme permit signal to flow in amounts proportional to the degree of rotation. Note: There is no Overload Indicator or Attenuator Control associated with the Auxiliary Input Volume Control.

Echo Control (Orange Pointer)

The Echo Control provides overall level adjustment of the signal present on the Echo Effect Buss and appearing at the ECHO SEND jack on the Rear Panel. Like the Auxiliary Input Volume Control, the Echo Control functions in the manner of a standard rotary volume control.

Control Descriptions (cont.)

Reverb Control (Orange Pointer)

The Reverb Control is a continuously variable rotary control that determines the amount of output signal from the PA-250's self-contained spring reverberation unit that reaches the Left and Right Mixing Busses. This control, therefore, regulates the amount of reverberated signal heard in the total mix. Like the Auxiliary Input Volume Control and Echo Control, the Reverb Control functions like a standard rotary volume control.

Headphone Volume Control (Orange Pointer)

This dual-section rotary volume control provides stereo headphone level control that is independent of the settings of the Left and Right Master or Monitor Volume Controls. The output of the PA-250's stereo headphone amplifier appears at the stereo phone jack on the Front Panel marked HEADPHONE.

Left and Right Master Volume Controls

The Left and Right Master Volume Controls are two independent sliding faders that regulate the level of the signals reaching the Left and Right Channel Power Amplifier stages from the Left and Right Mixing Busses, thus acting as overall volume controls for the PA-250. These controls act on the Mixing Buss signals at points in the signal paths *after* the Left and Right Channel Peak Level Indicators, and *after* the Graphic Equalizers. The line level signals (+4 dBm) from the outputs of the Left and Right Master Volume Controls, in addition to being sent to the Power Amplifier inputs, appear at the MASTER OUT L and R phone jacks on the Rear Panel. When the Left and Right Master Volume Controls are at the bottom limit of their travel (marked with a zero [0] on the Control Panel), *no signal* will appear at either the SPEAKER L and R RCA jacks or the MASTER OUT L and R phone jacks. However, the Peak Level Indicators will still function, and signal will be present at the REC OUT L and R RCA jacks on the Rear Panel. As the Left and Right Master Volume Controls are advanced upward, the level at the SPEAKER L and R and MASTER OUT L and R jacks will increase.

Left and Right Monitor Volume Controls

The Left and Right Monitor Volume Controls derive their signals from the same points in the PA-250 circuitry as do the Left and Right Master Volume Controls, i.e., from the Left and Right Mixing Busses, *after* the Graphic Equalizers and *after* the Peak Level Indicators (see Block Diagram). The signals from these points pass through the Left and Right Monitor Volume Controls and appear at the MONITOR OUT L and R phone jacks on the Rear Panel. The nominal signal level at these jacks is +4 dBm. When the Left and Right Monitor Volume Controls are at the lower limit of their travel (marked with a zero [0] on the Control Panel), *no signal* will be present at the MONITOR OUT jacks. As the Left and Right Monitor Volume Controls are advanced upward, the signal level at these jacks will increase. All other functions of the PA-250 are independent of the Left and Right Monitor Volume Controls.

Power On/Off Switch

This is a push-on/push-off switch that controls the flow of A.C. power to the power supply circuitry of the PA-250. The Power On/Off Switch *must* be in the ON (depressed) position for the PA-250 to perform any function.

Visual Indicators

Pilot Lamp

The Pilot Lamp is a red LED that lights when AC power is present in the PA-250 power supply circuitry.

Left and Right Peak Level Indicators

The Left and Right Peak Level Indicators are ten-section LED displays that provide visual indication of peak audio power levels present on the Left and Right Mixing Busses. The Peak Level Indicators sense the Mixing Buss levels *after* the signals are processed through the Graphic Equalizers, but *before* the signals reach the Left and Right Master or Monitor Volume Controls. Therefore, changing the settings of any of these controls will not alter peak level indications. Once the Attenuator Controls are set according to the procedure outlined in the Installation and Operation Section, only the settings of the Input Channel Volume Controls will affect the readings of the Peak Level Indicators. The recommended range of Mixing Buss levels as shown on the Peak Level Indicators is −3 dB to 0 dB for average levels, and up to +3 dB for occasional peaks.

The first eight LED sections of the Peak Level Indicators, covering the range of levels from −21 dB to 0 dB, are green, and the LED sections covering the range from +1 dB to +3 dB are red. This arrangement provides visual warning of excessive Mixing Buss levels even if the PA-250 operator's attention is temporarily focused elsewhere.

Rear Panel Connections

INPUTS 1-8 (PA-250: 1/4" phone jacks PA-250C: 8 standard XLR-type and 1/4" phone jacks)

These jacks provide signal access to the eight Input Channels of the PA-250. The impedance at these inputs is 10 kΩ, and they will accept signal from any source with a compatible output impedance (10 kΩ or less) and level (−50 dBm to −10 dBm). Most microphones, musical instrument pick-ups, electric keyboard outputs, signal processing devices and tape deck outputs are in this category. CAUTION: Do not connect the output of *any* power amplifier (e.g., guitar amplifier, PA head, etc.) to *any* PA-250 input.

PHONO L and R

This pair of inputs (input impedance 47 kΩ, nominal input level −45 dBm is for the purpose of connecting the output of a stereo disc playback cartridge to the fixed RIAA equalization circuitry associated with Input Channels 1 and 2. The signals from these jacks are sent to Input Channels 1 and 2 when the Attenuator Controls for those Input Channels are in the fully counter-clockwise, detented position marked PHONO on the Control Panel (see Control Descriptions, *Attenuator Control*).

AUX IN L and R (2 standard ¼" phone jacks and 2 RCA jacks)

Although two left/right pairs of connections are provided, only one pair, either phone jacks *or* RCA jacks, can be employed at one time. If both pairs are used, only the phone jacks will be operational. These Auxiliary Inputs have a rated impedance of 50 kΩ and a nominal input level requirement of −20 dBm. Signals from these inputs are routed through the dual-section Auxiliary Input Volume Control to the Left and Right Mixing Busses. Signal sources that may be connected to the Auxiliary Inputs include rhythm devices (Roland...) tuners, special effects devices (Roland SBF-325, SDD-320), tape deck outputs, etc.

MIXING BUSS IN L and R (2 standard ¼" phone jacks)

These jacks provide direct signal access to the Left and Right Mixing Busses, and are intended to serve as a means of connecting the line level outputs (−15 dBm) of another mixer (e.g., from the MASTER OUT L and R jacks of a PA-150 or PA-80) to the Output Channels of the PA-250. Signals entering the MIXING BUSS IN L and R jacks are processed through the PA-250 Graphic Equalizers and contribute to the level monitored by the Peak Level Indicators.

ECHO RETURN (1 standard ¼" phone jack)

A single channel input with an impedance of 50 kΩ, and a recommended nominal input level of −20 dBm, the ECHO RETURN input is connected to the Left and Right Mixing Busses through a dividing network. This network splits the signal from the ECHO RETURN jack and injects it into the Left and Right Mixing Busses in equal amounts. Thus, when the PA-250 is used to create a stereo field the ECHO RETURN signal will appear centered in the field. The ECHO RETURN jack is intended as the connection point for the output of an external echo device. The actual level of the Echo signal reaching the Mixing Busses is determined by the output level of the external echo device.

AC Power Cord and Plug

Models of the PA-250 designed to operate from an AC supply voltage of 120 or 220/240VAC are shipped with three-prong plugs on the end of the AC Power Cord. Models designed to operate from a 100/120VAC supply are shipped with two-prong plugs. Check the Rear Panel identification tag to determine the proper supply voltage for your PA-250. Consult your Roland dealer before attempting to use the PA-250 outside the country.

Outputs from the PA-250

REC OUT L and R (2 RCA jacks)

These outputs are intended to provide a 2-channel line level feed (0 dBm nominal level, 1 kΩ output impedance of the PA-250 Mixing Buss signals to a tape deck. The actual output level at the REC OUT jacks is independent of the settings of either the Master or Monitor Volume Controls. Therefore, overall Left and Right Channel levels for recording must be adjusted at the tape deck inputs. Also, the REC OUT output signals are derived at points in each Output Channel *before* the Graphic Equalizers, so the tonal characteristics of the REC OUT signals are independent of the Graphic Equalizer settings.

Outputs from the PA-250 (cont.)

ECHO SEND (1 standard ¼" phone jack)

The single channel line level output at this jack (0dBm nominal level, 1kΩ impedance, is the combination of all the signals sent to the Echo Effect Buss. The overall level of this combined signal depends on the setting of the Echo Control. The ECHO SEND signal is suitable for driving an external echo device (Roland...) or other equipment (see Applications).

MONITOR OUT L and R (2 standard ¼" phone jacks)

These are line level outputs (+4 dBm nominal level, 1 kΩ output impedance, that are derived from the Left and Right Mixing Busses *after* the Graphic Equalizers and Peak Level Indicators. The actual levels at the MONITOR OUT jacks depend on Peak Level indications and the settings of the Left and Right Monitor Volume Controls. These outputs can be used to feed external power amplification (Roland SPA-120, SPA-240), or other audio equipment (see Applications).

MASTER OUT L and R (2 standard ¼" phone jacks)

These line level outputs (+4 dBm nominal level, 1kΩ output impedance, are derived from the Left and Right Mixing Busses *after* the Graphic Equalizers and Peak Level Indicators. The actual levels at these outputs are determined by Peak Level indications and the settings of the Left and Right Master Volume Controls. The output signals from the MASTER OUT jacks can be used to drive external power amplification, to supply line level signal to the MIXING BUSS IN jacks of another mixer, or other audio equipment (see Applications).

SPEAKER L and R (4 standard ¼" phone jacks, 2 Left, 2 Right)

The signals at these jacks are the output signals from the PA-250 Power Amplifiers and are intended to feed speaker systems (Roland PS-80). The two jacks for each channel are wired in parallel. Each channel (Left or Right) can feed two 8 Ω speakers or *one* 4 Ω speaker. The nominal power output of each channel is 85 watts rms into an 8 Ω load, or 125 watts rms into a 4 Ω load. The actual level at the SPEAKER jacks depends on the level of the signals shown on the Peak Level Indicators and the settings of the Left and Right Master Volume Controls.

CAUTION: Under no circumstances should the total load impedance connected to either SPEAKER L or SPEAKER R jacks be less than 4 Ω. Remember, two 8 Ω speakers being driven by the same SPEAKER output are in parallel, and therefore present a total load impedance of only 4 Ω. No other speakers should be connected to a SPEAKER output that already has either two 8 Ω speakers or one 4 Ω speaker connected to it, since doing so will lower the total load impedance below 4 Ω.

Other Rear Panel Connections

GND

This binding post provides a means of connecting a ground wire from a turntable or other equipment to the PA-250 chassis.

Other Connections (Front Panel)

HEADPHONE (1 standard ¼" stereo phone jack)

This jack carries the stereo output signals from the PA-250 headphone amplifier. The headphone level depends on the Mixing Buss levels as shown on the Peak Level Indicators and on the setting of the Headphone Volume Control. This level is independent of the settings of the Master Volume Controls.

After carefully removing the PA-250 from its shipping carton, remove packing materials that may be attached to the unit. Retain the shipping carton and packing materials for future transportation or long-term storage of the PA-250.

In sound reinforcement applications, the location of the PA-250 with respect to the stage is important. Whenever possible, the PA-250 should be located so that the operator hears the performance through the reinforcement system in the same way that the audience does. If such a location is not possible, the operator can either monitor the balance by means of the PA-250's self-contained stereo headphone circuitry, rely on an assistant who is suitably located to judge the musical balance of the performance, or a combination of these methods.

The physical environment in which the PA-250 is located should be free of excessive dust and humidity. Also, the convective cooling system of the PA-250 requires that at least 3" of unobstructed air space be provided around the louvered portions of the chassis (except the bottom, which is elevated on built-in supports).

1. Before connecting the PA-250 to the proper AC supply (see rear panel identification plate for requirements), check all controls to make sure they are at these positions:

Control	Position
Power On/Off	Off
Stand By Switches	All on Stand By
Attenuator Controls	All at −40 dB. For Input Channels 1 and 2, −35 dB, just clockwise from Phono dentent
Equalizer Controls	All at flat (0) settings
Effect Controls	All at 0 settings
Panpots	All at center (0) settings
Input Channel Volume Controls	All at 0 settings
Graphic Equalizer Controls	All sliders at 0 dB settings
Auxiliary Input Volume Control	At 0 setting
Echo Control	At 0 setting
Reverb Control	At 0 setting
Headphone Volume Control	At 0 setting
Left and Right Master Volume Controls	At 0 setting
Left and Right Monitor Volume Controls	At 0 setting

(Note: All controls should be returned to these positions at the end of a period of use, both as a courtesy to the next operator, and as a means to insure proper set-up procedures for the next period of use.)

2. Check the Rear Panel fuse holder for the presence of a properly rated fuse. The fuse rating is printed on the Rear Panel, above the fuse holder.

3. Connect the PA-250 to the proper AC supply as indicated on the Rear Panel Identification Tag. Caution: Do not make or break the connection between the PA-250 and the AC supply unless the Power On/Off Switch is in the OFF position.

4. Connect signal sources to the proper inputs as outlined in the Rear Panel Connections descriptions and the diagram accompanying this section. (Fig. 1) If the PHONO L and R jacks are used, make sure that the ground wire from the turntable is connected to the post marked GND on the Rear Panel.

5. Connect additional equipment as required:

External Equipment	Connection
Speakers	To Speaker and R jacks
Headphones	To Headphone jack on Rear Panel
Tape Deck Line Inputs	To Rec Out L and R jacks
Tape Deck Line Outputs	To Aux In L and R jacks
External Echo Device Input	To Echo Send jack
External Echo Device Output	To Echo Return jack
External Power Amplification Inputs	To Monitor Out L and R jacks

[Caution: The next two interconnections must not be attempted at the same time between the same two mixers. Damage to equipment will result.]

Line Level Outputs of Additional Mixer	To Mixing Buss in L and R jacks
Mixing Buss Inputs of Additional Mixer	To Master Out L and R jacks

(Caution: Do not make or break *any* connections to the PA-250 while the Power On/Off Switch is in the ON position.)

Note: the types of additional equipment and the basic operations described in this section are intended to represent a situation in which all of the facilities of the PA-250 are used in a fairly straight-forward manner. More involved interconnections and operations are described in the Applications section.

6. Activate the Power On/Off Switch by pressing the Switch button once and releasing it. Caution: Do not activate the Power On/Off Switch unless all controls are in the positions described in Step 1.

7. Set the Standby Switches on the Input Channels to be used to either ECHO or REV, depending on which effect is needed for each input. (Remember, the Echo effect requires the use of an external echo device.) If no effect is desired, one or the other Effect Buss must still be selected (see Control Descriptions, Stand By Switches and Effect Control).

8. Have the performers play (and/or sing) in a manner as dynamically close to an actual perform-

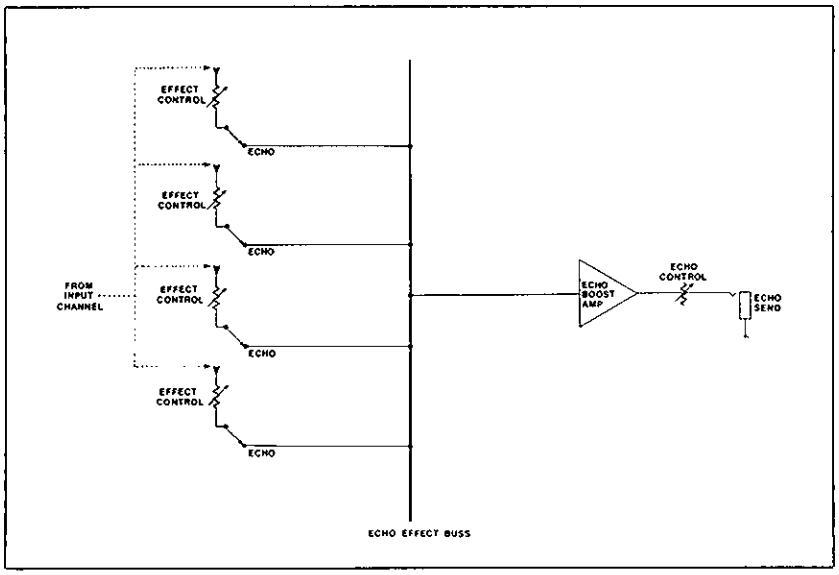


Figure 2

ance as possible. During this time, turn the Attenuator Control on Input Channel 1 clockwise until the Overload Indicator begins to flash in response to the input signal. Then, turn the Attenuator Control *counter-clockwise* to reduce the signal level by approximately 10 dB as shown on the scale around the Attenuator Control. Repeat this step with each Input Channel to be used. This procedure will provide optimally low noise levels and allow sufficient headroom to prevent overload distortion in any of the Input Channels.

9. This step in the operational procedure for the PA-250 describes a method for achieving a sound reinforcement balance. In actual performance situations, the process may not go quite as smoothly as outlined here. This is possible because a pleasing musical balance does not come about instantaneously, nor will a balance, once achieved, please everyone concerned. Patience during the initial period of adjustment and re-adjustment is required of performers and equipment operators alike.

Begin to raise the Input Channel Volume Control for the Input Channel that carries the signal from the hottest source. This Input Channel will most likely have its Attenuator Control further counter-clockwise than the others. While raising the volume control, observe the action of the Peak Level Indicators. At this time, raise the Input Channel Volume Control (the hottest one) until the Peak Level indication is −3 dB on both Left and Right Channels. Raise the Left and Right Master Volume Controls to the 5 settings. (Note: If the MONITOR OUT L and R jacks are being used to send signals to external power amplification, raise the Left and Right Monitor Volume Controls to the 5 settings.) Begin to raise the other Input Channel Volume Controls, using them to achieve a pleasing musical balance among the various musical elements. At this time, left-to-right positioning of input signals across the stereo field can be accomplished using the Panpot Controls (see Control Descriptions, Panpot Controls).

During the initial balancing and positioning processes, some Overload Indicators that stopped flashing during the Attenuator Control adjustment in Step 8 might start flashing again because of dynamical changes in the musical performance. If this occurs, re-adjust the Attenuator Controls and re-balance using the Input Channel Volume Controls.

Throughout the balancing and re-balancing procedure, observe the Peak Level Indicators. These displays sample the Mixing Buss signals *before* the Left and Right Master Volume Controls, and the indications are independent of these controls (which should still be at the 5 settings). Once the Attenuator Controls are set, only the Input Channel Volume Control settings will alter the Peak Level indications. At no time should the Peak Level Indicators read levels consistently in the +1 dB to +3 dB range. Occasional peaks reaching these levels are permissible, but failure to keep overall Peak Level indications within the recommended range (−3 dB to 0 dB for average levels, to +3 dB for occasional peaks) may result in distorted signals and/or damage to speaker systems.

Once an initial trial balance has been achieved, either Echo or Reverberation effects (or both) may be added to the mix. The setting of the Effect Control for each Input Channel determines the depth of the Effect selected with the Stand By Switch for that input signal. For the Echo Effect Buss, the Echo Control serves as a master, or overall depth control, as it regulates the overall signal level reaching an external echo device. The level of echo signals entering the ECHO RETURN jack, and therefore entering the total mix, is determined by the output level of the external echo device. The Reverb Effect Buss has no master send control. The settings of the individual Effect Controls determine the input level

to the PA-250's self-contained reverberation unit. The Reverb Control setting determines the level of signal returning to the mix from the reverberation unit.

The Equalizers on each Input Channel can be used to alter the tonal characteristics of any input signal. In some cases, use of equalization on a particular input signal may greatly increase the contribution of that input signal to the Peak Level indications. For example, turning the High (treble) Equalizer Control to +4 on an Input Channel carrying a vocal may not affect Peak Level indications significantly, but doing the same on an Input Channel carrying an electric guitar playing in a high register certainly will have an effect on the indications. If situations like this occur, re-balancing using the Input Channel Volume Controls will be necessary.

Although the above procedural steps for achieving a trial balance are described in a particular sequence, actual situations will usually require alternating back and forth between different adjustments. For instance, echo (or reverb) and equalization both alter the aural characteristics of musical elements of a mix, so a complementary blend of their application can only be achieved by careful listening and adjustment. As an example, a signal that sounds good with a certain degree of Low (bass) boost equalization may begin to sound muddy and unclear when echo or reverb is added. If the demands of the music are such that the echo or reverb effect is definitely required, some compromise must be made in the Equalizer setting.

Through co-ordinated use of the Input Channel Volume Controls, Equalizers, Panpots and Effect Controls, a final balance can be developed from the initial trial balance. The Left and Right Master (and/or Monitor) Volume Controls can now be raised to obtain the desired overall sound level from the speakers.

If feedback (a howling or whistling through the system caused by acoustical linkage between speakers and microphones) begins to occur as the Master (and/or Monitor) Volume Controls are raised, use of the Graphic Equalizers can help to eliminate the problem. The Graphic Equalizer Controls act to boost or cut the Mixing Buss signals in nine narrow (one octave wide) bands across the audio spectrum. Each control is labeled with the center frequency of the affected band: 63 Hz, 125 Hz, 250 Hz, 500 Hz, 1 KHz, 2KHz, 4 KHz, 8 KHz, 16 KHz. Since pitch and frequency are directly related, the pitch of a feedback howl or whistle will give an initial indication of which Graphic Equalizer Control(s) will be most effective. For lower pitched rumbles or howls, use the 125 Hz, 250 Hz, or 500 Hz Controls, either singly or together to cut signal levels in this portion of the spectrum. For higher-pitched squeals or whistles, the 1 KHz, 2 KHz, or 4 KHz controls should be helpful. Ideally, the Graphic Equalizer settings for both Left and Right Channels should be nearly identical. If the settings on the two channels are substantially different, centering of signals within the stereo field will become difficult to accomplish.

In addition to being used for feedback reduction, the Graphic Equalizers can be used to make up for deficiencies in the acoustical characteristics of a performance location. In whatever capacity the Graphic Equalizers are used, the settings will affect Peak Level indications in the same way as described for Input Channel Equalizers.

If feedback occurs at a low setting of the Master Volume Controls, the relative positions of microphones and speakers are probably contributing to the problem. In general, it is best to use directional microphones, and to have reinforcement speakers placed downstage of the most forward microphone location. (Note: If microphones are to be hand-held, avoid using directional microphones with vents along the length of the microphone case. These vents determine the directional characteristics of the microphone, and if they are covered up when the microphone is hand-held, the directional pattern of the microphone will become non-directional. This set of circumstances will produce immediate feedback if the system was initially balanced without any microphones being hand-held. There is available a wide variety of directional microphones that do not rely on full-length venting to achieve directionality.)

If the MONITOR OUT L & R jacks are used to feed external power amplification, and this power amplification in turn is used to feed *stage monitor* (as opposed to house reinforcement) speakers, avoidance of feedback becomes a much different problem, in that relative positions of microphones and speaker cabinets become critical. There is not much specific guidance that can be offered here, other than the suggestion to employ trial-and-error positioning and re-positioning. Through such a process, a positioning scheme will be found that will be the best compromise between the performers' requirements for stage monitoring and maximum monitor levels possible without feedback. (Note: Methods for obtaining a monitor mix that is independent of the reinforcement mix are outlined in the Applications section.)

Feedback can also occur during a disc playback. The best preventive against this possibility is acoustical isolation of the turntable from the sound field generated by the speakers. A turntable should not be placed on any surface that is in contact with a speaker cabinet.

PA-250 Applications

The Roland PA-250 is a very versatile piece of audio equipment, as will become evident from the discussions in this section. Before going on to specific applications, it would be helpful to repeat a listing of the Rear Panel Connections, grouped as Inputs and Outputs, along with the nominal levels and impedances for each connection.

Inputs

INPUTS 1 - 8	−50 dBm to −10 dBm, 10 kΩ. Recommended source impedance 10 kΩ or less	AUX IN L & R	−20 dBm, 50 kΩ
PHONO L & R	−45 dBm, 47 kΩ	MIXING BUSS IN L & R	−15 dBm
		ECHO RETURN	−20 dBm, 50 kΩ

Outputs

REC OUT L & R	0 dBm, 1 kΩ
ECHO SEND	0 dBm, 1 kΩ
MONITOR OUT L & R	+4 dBm, 1 kΩ
MASTER OUT L & R	+4 dBm, 1 kΩ
SPEAKER L	125 watts rms into a 4 Ω load, 85 watts rms into an 8 Ω load
SPEAKER R	125 watts rms into a 4 Ω load, 85 watts rms into an 8 Ω load

Caution: Under no circumstances should the load impedance on either SPEAKER L or SPEAKER R Outputs be less than 4 Ω.

Caution: Do not connect *any* PA-250 Output to another PA-250 Output.

Caution: Do not connect *any* PA-250 Output to *any* PA-250 Input on the same unit. Interconnections between *different* PA-250's can be made according to the descriptions in the Rear Panel Connections Section and the Installation and Operation Section.

Although these connections are labeled to indicate their primary uses, as long as level and impedance requirements are observed, they may be used in a variety of ways.

Application Note #1

Obtaining an independent monitor mix, with no effects (Echo or Reverb). Additional equipment required: one channel of power amplification, stage monitor speakers.

It is sometimes desired to obtain a musical balance for stage monitoring that is different from the balance heard in the house reinforcement speakers. Such an independent stage monitor mix is possible with the PA-250 (and additional equipment as listed) while maintaining a stereo feed from the SPEAKER L & R outputs. However, the use of effects is not possible for any input signals that must be present in the monitor mix. The Echo system is completely disabled in this arrangement, but Reverb can still be used. Input signals for which Reverb is desired cannot, however, appear in the monitor mix.

The Echo Effect system is actually a separate mixing buss, with independent volume controls on each input (the Effect Controls on Input Channels with Stand By Switches set to ECHO) and a master level control (the Echo Control). The output of this mixing buss is available at the ECHO SEND jack on the Rear Panel. To use the Echo system as an independent monitor mixer, set the Standby Switches to ECHO on those Input Channels carrying signals that will be part of the monitor mix. Connect the ECHO SEND jack to the input of a channel of external power amplification, and the output of the power amplification to the stage monitor speakers. The speakers will now carry a mix that can be adjusted to meet stage monitor requirements independently of the balance heard in the house reinforcement speakers. Overall stage monitor level is now regulated by the Echo Control. Remember, the stage monitor mix, as now derived, is not processed through either of the Graphic Equalizers. All other functions and capabilities of the PA-250 remain unchanged.

Application Note #2

Obtaining an independent monitor mix, *with* Echo effect. Additional equipment required (other than shown): one channel of power amplification, stage monitor speakers.

As far as deriving the independent monitor mix is concerned, the procedure and set-up are identical to those in Application Note #1. As before, the Reverb system remains unaltered, except that Input Channels sending signals to the Reverb Effect Buss cannot also feed the monitor mix. An alternate Echo send can be developed, but at the expense of a stereo house reinforcement feed, and any reinforcement feed from the MONITOR OUT jacks. Also required is the use of *two* 8Ω speakers each for the SPEAKER L and SPEAKER R outputs. As shown in Fig. 3, the speakers must be located so that there is a *left and right speaker* on each side of the stage area. This arrangement will produce a monaural sound field, regardless of the settings of the Panpot Controls.

It is with the Panpot Controls that an alternate Echo send is developed. As mentioned above, since each side of the stage area has both a left and a right speaker, the positioning function of the Panpot Controls is effectively defeated. Input signals will still be divided between the Mixing Busses according to the Panpot settings, (see Control Descriptions, Panpot Control) but changing these settings will have no aural effect because of the way the speakers are arranged.

The MONITOR OUT R jack is used as the alternate echo send output connection, and this jack should be connected to the input of an external echo device. The output of the external echo device should be connected to the ECHO RETURN jack on the Rear Panel.

Application Note #2
(cont.)

If no echo send signal is desired from a particular Input Channel, the Panpot Control for that Input Channel should be fully counter-clockwise, sending all of the associated input signal to the Left Mixing Buss and none to the Right Mixing Buss. Since the MONITOR OUT R signal is derived from the Right Mixing Buss, no signal sent to the Right Mixing Buss means no signal sent to the external echo device.

To send signal to the external echo device from an Input Channel, the Panpot Control for that Input Channel should be turned clockwise from the fully counter-clockwise position. As this is done, the degree of clockwise rotation will determine how much of the associated input signal will be sent to the Right Mixing Buss, and through the Right Monitor Volume Control to the MONITOR OUT R jack. The Right Monitor Volume Control now serves as a master echo control, regulating the overall level of the signal sent to the external echo device.

In order to prevent a very one-sided distribution of signal levels on the Mixing Busses due to the Panpot settings, the Right Monitor Volume Control should be kept at the 5 setting or lower. This will tend to cause more clockwise (closer to centered) positioning of the Panpot Controls for a given level of echo send.

All other functions of the PA-250 remain unchanged, except the Reverb Effect, as described earlier. However, because of the non-standard use of the Panpot Controls, the output pairs REC OUT L & R and MASTER OUT L & R will not carry true stereo signals.

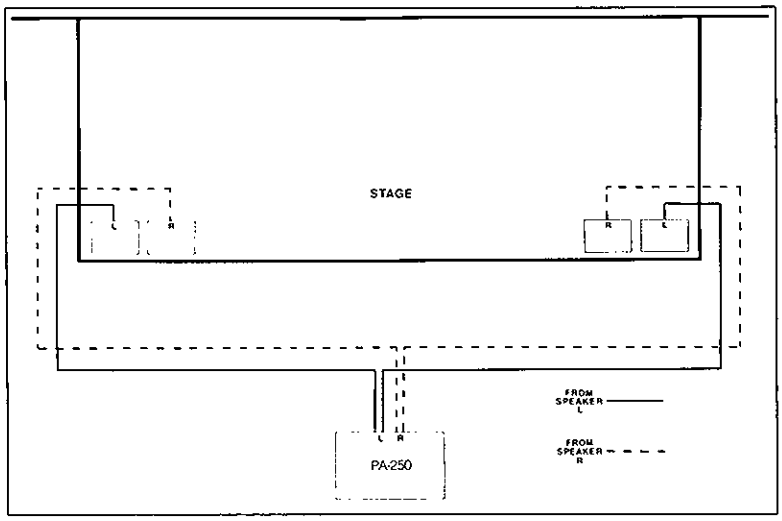


Figure 3

Application Note #3

There are many sound reinforcement situations in which the eight inputs of the PA-250 cannot cover all the necessary input sources. In such cases, the PA-250 can be stacked with another PA-250 or with a Roland PA-80. This stacking is accomplished in several ways. First, the MASTER OUT L & R jacks of one mixer can be connected directly to the MIXING BUSS IN L & R jacks on a second mixer. Now, the first mixer can send signals through its own Power Amplifier Channels as well as through those of the second mixer. Second, the MONITOR OUT L & R jacks of one PA-250 can be connected to the MIXING BUSS IN L & R jacks of a second mixer. Now, the Power Amplifier signals of the first mixer can be muted by dropping the Left and Right Master Volume Controls on the first mixer to their minimum (0) settings.

Application Note #4

The Left and Right Mixing Buss signals appear at the REC OUT L & R jacks on the Rear Panel. These jacks receive their signals from points in the signal paths before the Left and Right Master (and Monitor) Volume Controls, before the Graphic Equalizers, and before the Peak Level Indicators. When the PA-250 is being used for sound reinforcement/stage monitor work primarily, the independence of the REC OUT L & R jacks makes them the ideal connection points for tape deck inputs. However, the MONITOR OUT L & R jacks can be used at other times, when tape recording is the primary function. Using the MONITOR OUT L & R jacks to feed the inputs of a 2-channel tape recorder (either cassette or reel-to-reel) has certain advantages. First, the Left and Right Monitor Volume Controls can be used to regulate overall Left and Right levels to the recorder. Second, the Peak Level Indicators and Graphic Equalizers are now in the signal path to the recorder. Third, if the PA-250 and the speakers connected to it are not acoustically isolated (in a separate room) from the performers, the Headphone output can be used to monitor the recording aurally, while the feed to the speakers can be muted by dropping the Left and Right Master Volume Controls to their minimum (0) settings.

To play back 2-channel recordings through the PA-250, connect the Line Out jacks on the tape deck to the AUX IN L & R jacks on the Rear Panel. The Auxiliary Volume Control setting, in conjunction with the settings of the Left and Right Master Volume

Controls, will now determine the level at which the playback is heard through the speakers. Headphone monitoring is also still available. Remember, when playing recordings back through the AUX IN jacks, that the Graphic Equalizers are in the signal path between the tape deck and the monitoring facilities (either speakers or headphones). Therefore, for accurate playbacks, the Graphic Equalizer Controls should all be at the 0 dB setting. Also, the Auxiliary Volume Control *must* be returned to the 0 position after a playback and before any further recording is attempted, or slapback will occur due to the presence of playback signal in the recording mix.

The MONITOR OUT L and R jacks of the PA-250 can also be used to send signal to one or two tracks of a multi-track (4 or more) tape recorder. The initial set-up and operation are identical to those outlined above for normal 2-channel recording, except for playback. If subsequent overdubs or self-synching are attempted, some means must be provided for the performers doing the overdubs to hear the previously recorded tracks in order to play or sing along with them. To accomplish this, disconnect the sources that were connected to INPUTS 1 and 2 during the initial recording, and connect the line outputs of the two tape recorder channels corresponding to the already recorded tracks to these INPUTS (1 and 2). Set the Attenuator Controls on Input Channels 1 and 2 to just clockwise of the PHONO detent, and set the Panpot Controls on these same Input Channels fully *counter-clockwise*.

This arrangement will play the two recorded tracks back through Input Channels 1 and 2, but these playback signals will only be sent to the Left Mixing Buss and its associated circuitry. The remaining Input Channels, with Panpot Controls set fully *clockwise*, and the Right Channel (specifically the MONITOR OUT R jack) can be used to record on the next empty tape track. When this third track has been recorded, disconnect the source that was connected to INPUT 3 during the recording, and connect the line output of the tape recorder channel corresponding to the newly recorded track to INPUT 3. Set the Attenuator Control and Panpot Control on Input Channel 3 to match the settings given for the same controls on Input Channels 1 and 2. The newly recorded track will now play back through Input Channel 3, and this signal will be part of the cue/monitor mix on the Left Channel. The cue/monitor mix can be heard either through the speaker(s) connected to the SPEAKER L jack(s), or through the left side of the Headphone feed. Of course, after three tape tracks have been returned to Input Channels for playback, only Input Channels 4 through 8 will be available to accept live input sources for further recording. However, the process outlined above can be continued for any number of tracks, up to a maximum of eight. Each time an input is used to playback a tape track, one less input is available for a live source, down to the eighth track, during the recording of which only one Input Channel, 8, will be available. Remember, after the initial two tracks are recorded, the Left Channel of the PA-250 is used for monitoring only, while the Right Channel is used for recording only. An exception to this arrangement is discussed in the next paragraph.

For situations in which one or more already-recorded tracks are to be mixed either with each other or with live signals, the procedure is essentially the same as before. The decision must be made as to whether the new combination will be recorded on one track or on two. If the new combination is going to be recorded on one track, only the Input Channels that are carrying signals (either tape playback or live) that are part of the recording mix should have Panpot Controls set fully clockwise. All other Input Channels should have the Panpot Controls set fully *counter-clockwise*.

If the new combination is to be recorded on *two* tracks, only those Input Channels that are carrying signals to be recorded should be activated at all. The Stand By Switches on all other Input Channels should be on STAND BY. Panpot Controls on Input Channels contributing to the recording mix can be adjusted as required for positioning within the 2-channel mix.

Once a multi-track recording is completed, overdubs and all, the PA-250 can be used as a stereo remix console. Up to eight line-level tape playback channels can be connected to INPUTS 1 to 8, and the stereo mix can be recorded on a 2-channel recorder connected to the MONITOR OUT L and R jacks. Set-up and operation are essentially the same as outlined in the Installation and Operation Section, except that the input signal sources are now tape track playbacks instead of microphones or other live sources.

PA-250
Specifications

Inputs:

8 unbalanced, 10kΩ input impedance, −50 dBm to −10 dBm. Recommended source impedance 10kΩ or less.
2 Phono, 47kΩ input impedance, −50 dBm. Recommended source impedance 10kΩ to 50kΩ.
2 Auxiliary, 50kΩ input impedance, −20 dBm, Recommended source impedance 10kΩ.
2 Mixing Buss In, −15 dBm. Recommended source impedance below 10kΩ.
1 Echo Return, 50kΩ input impedance, −20 dBm. Recommended source impedance 10kΩ.

Outputs:

2 Rec Out (L & R), 1kΩ output impedance, 0 dBm. Recommended load impedance 10kΩ or higher.
2 Monitor Out (L & R), 1KΩ output impedance, +4 dBm. Recommended load impedance over 1kΩ or higher.
2 Master Out (L & R), 1kΩ output impedance, +4 dBm. Recommended load impedance over 1kΩ or higher.
1 Echo Send, 1kΩ output impedance, 0 dBm. Recommended load impedance over 1kΩ.
2 Speaker (L & R) 125 watts rms each into 4Ω
85 watts rms each into 8Ω
1 AC outlet, unswitched, 300 watts maximum

Power Consumption:

This is shown on the name plate of the PA-250 or PA-250C.

Dimensions:

28(W) x 8½(H) x 21(D) in.
603(W) x 190(H) x 505(D) mm.

Weight:

44 lbs.
20 kg.

Note: Other than the fuse holder on the Rear Panel, there are no user-accessible service points on or in the PA-250. If the proper fuse is in place, all connections are carefully made as outlined in the Installation and Operation Section, and recommended set-up procedures are followed, the PA-250 will perform as described. If it does not, carefully inspect all connections and review the set-up procedure. If operating functions are still impaired, consult your Roland dealer concerning authorized repair facilities.